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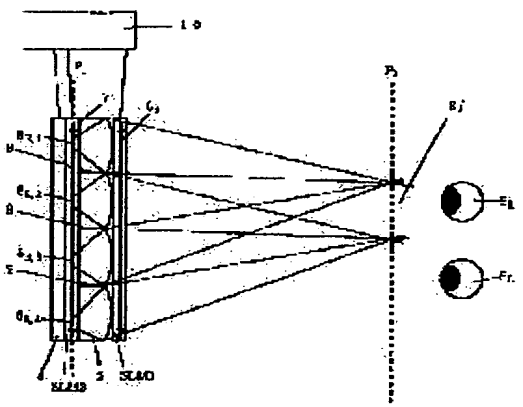
(71)Applicant : CANON INC
(72)Inventor : SUDO TOSHIYUKI

(54) STEREOSCOPIC PICTURE REPRODUCING DEVICE

(57)Abstract:
PURPOSE: To obtain a spectacles-less 3D display type stereoscopic picture reproducing device in which a crosstalk is not generated and which does not make a reverse stereoscopic viewing generate and is excellent in the separating of parallatic pictures.
CONSTITUTION: An opening pattern 7 in which plural openings 8 are arranged in the horizontal direction is lighten by a lighting means 4 and the plural openings 8 are superposed at finite distance to be formed as a first exit pupil 8R' by a cylindrical lens array 2 constituted by arranging plural cylindrical lenses provided corresponding to plural openings 8 and also a parallatic picture to be displayed on a space light modulator SLM provided in the vicinity of the cylindrical lens array 2 is lighten by luminous flux from the openings 8 and when the parallatic picture is changed to another parallatic picture, the positions of plural openings 8 are changed in synchronization with this and images of plural openings 8 are superposed at the position different from that of the first exit pupil 8R' to be formed as a second exit pupil. Then, the parallatic picture is observed from the first and the second exit pupil positions by periodically repeating these operations.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The opening pattern which arranged two or more openings horizontally with the lighting means is illuminated. While superimposing these two or more openings on finite distance by the cylindrical-lens array which puts in order two or more cylindrical lenses prepared corresponding to these two or more openings through an opaque septum, and changes and forming as the 1st exit pupil When the parallax image displayed on the space optical modulator for a display installed near this cylindrical-lens array according to the flux of light from this opening is illuminated and this parallax image is replaced with another parallax image It repeats periodically changing the location of two or more of these openings synchronizing with this, superimposing on the location where the image of two or more of these openings differs from this 1st exit pupil, and having made it form as the 2nd exit pupil. an observer -- this parallax image -- this -- the stereoscopic model regenerative apparatus characterized by making it observe from the 1st and 2nd exit pupil location.
[Claim 2] Said opening pattern is the stereoscopic model regenerative apparatus of claim 1 characterized by forming with the space optical modulator.
[Claim 3] The screen which displays said parallax image is claim 1 or the stereoscopic model regenerative apparatus of 2 characterized by being in agreement with the optical principal plane of said cylindrical-lens array.
[Claim 4] The opening pattern which arranged two or more openings horizontally with the lighting means is illuminated. According to the projection optics which has one cylindrical convex lens which has refractive power only to the cylindrical-lens array which puts in order two or more cylindrical lenses prepared corresponding to these two or more openings through an opaque septum, and changes, and a horizontal direction While superimposing these two or more openings on finite distance and forming as the 1st exit pupil When the parallax image displayed on the space optical modulator for a display installed near this cylindrical-lens array according to the flux of light from this opening is illuminated and this parallax image is replaced with another parallax image It repeats periodically changing the location of two or more of these openings synchronizing with this, superimposing on the location where the image of two or more of these openings differs from this 1st exit pupil, and having made it form as the 2nd exit pupil. an observer -- this parallax image -- this -- the stereoscopic model regenerative apparatus characterized by making it observe from the 1st and 2nd exit pupil location.
[Claim 5] Said opening pattern is the stereoscopic model regenerative apparatus of claim 4 characterized by forming with the space optical modulator.
[Claim 6] Opening corresponding to [have said projection optics in order from said opening pattern side in order of said cylindrical-lens array and said cylindrical convex lens, and this opening pattern is in the focal plane of this cylindrical-lens array, and] each cylindrical lens is claim 4 or the stereoscopic model regenerative apparatus of 5 characterized by being relatively located in the same location to each cylindrical lens.
[Claim 7] The screen which displays said parallax image is claims 4 and 5 or the stereoscopic model regenerative apparatus of 6 characterized by being in agreement with the optical principal plane of said cylindrical-lens array or said cylindrical convex lens.

[Claim 8] The opening pattern which arranged two or more openings two-dimensional with the lighting means is illuminated. While superimposing these two or more openings on finite distance by the eye lens array of the fly which puts in order two or more element lenses prepared corresponding to these two or more openings through an opaque septum, and changes and forming as the 1st exit pupil When the parallax image displayed on the space optical modulator for a display installed near the eye lens array of this fly according to the flux of light from this opening is illuminated and this parallax image is replaced with another parallax image It repeats periodically changing the location of two or more of these openings synchronizing with this, superimposing on the location where the image of two or more of these openings differs from this 1st exit pupil, and having made it form as the 2nd exit pupil. an observer -- this parallax image -- this -- the stereoscopic model regenerative apparatus characterized by making it observe from the 1st and 2nd exit pupil location.
[Claim 9] Said opening pattern is the stereoscopic model regenerative apparatus of claim 8 characterized by forming with the space optical modulator.
[Claim 10] The image of said opening is a stereoscopic model regenerative apparatus given in any 1 term of claims 1-9 characterized by horizontal width of face being 50mm or less.
[Claim 11] The stereoscopic model regenerative apparatus of claim 10 characterized by time amount until said two or more openings change a location periodically and form opening in the original location again being 1 / less than 30 seconds.
[Claim 12] Opening which the location of opening forms in the space light modulation means for adjustable openings with a lighting means is illuminated. While carrying out image formation of this opening to finite distance as the 1st exit pupil by the cylindrical-lens array which puts two or more cylindrical lenses in order horizontally, and changes A space light modulation means for a display to have two or more viewing areas which correspond to these two or more cylindrical lenses near this cylindrical-lens array is installed. A part of 1st parallax image displayed on one of these the viewing areas is illuminated through the cylindrical lens corresponding to this viewing area by the flux of light from this opening. A part of 2nd parallax image is displayed on the viewing area which displayed a part of 1st parallax image while changing the location of this opening. Illuminate a part of 2nd parallax image through the cylindrical lens corresponding to this viewing area by the flux of light from this opening, and image formation of this opening is carried out to the location which differs from this 1st exit pupil by this cylindrical lens as the 2nd exit pupil. this -- an observer -- this -- the 1st and 2nd parallax image -- this -- you make it observe in the 1st and 2nd exit pupil location -- this viewing area -- one by one -- changing -- these two or more viewing areas -- following -- this -- the 1st parallax image -- this -- the stereoscopic model regenerative apparatus characterized by displaying the 2nd parallax image.
[Claim 13] While carrying out image formation of this opening to finite distance as the 1st exit pupil by the eye lens array of the fly which illuminates opening which the location of opening forms in the space light modulation means for adjustable openings with a lighting means, puts two or more element lenses in order two-dimensional, and changes A space light modulation means for a display to have two or more viewing areas which correspond to these two or more element lenses near the eye lens array of this fly is installed. A part of 1st parallax image displayed on one of these the viewing areas is illuminated through the element lens corresponding to this viewing area by the flux of light from this opening. A part of 2nd parallax image is displayed on the viewing area which displayed a part of 1st parallax image while changing the location of this opening. Illuminate a part of 2nd parallax image through the element lens corresponding to this viewing area by the flux of light from this opening, and image formation of this opening is carried out to the location which differs from this 1st exit pupil with this element lens as the 2nd exit pupil. this -- an observer -- this -- the 1st and 2nd parallax image -- this -- you make it observe in the 1st and 2nd exit pupil location -- this viewing area -- one by one -- changing -- these two or more viewing areas -- following -- this -- the 1st parallax image -- this -- the stereoscopic model regenerative apparatus characterized by displaying the 2nd parallax image.
[Claim 14] The image of said opening is claim 12 or the stereoscopic model regenerative apparatus of 13 characterized by horizontal width of face being 50mm or less.

[Claim 15] The stereoscopic model regenerative apparatus of claim 14 characterized by the durations which display said 1st parallax image and all the 2nd parallax image being 1 / less than 30 seconds.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention makes possible stereoscopic vision by the above-mentioned observer using an observer's binocular parallax, and relates to the display unit which realizes the stereoscopic vision by the big screen.
[0002]
[Description of the Prior Art] Drawing 14 is drawing showing the concept of the conventional display unit currently indicated by JP,6-225344,A. This display unit arranges the light source 3 in an observer's 2 image formation location using the large-sized convex lens 1. Moreover, the space modulation elements 4, such as a liquid crystal panel, are installed like illustration between an observer 2 and the light source 3, for example.
[0003] Now, the light source 3 is put on the location as for which the image of an observer's 2 face carries out image formation, the light source 3 is shone in the magnitude of face image formation, and the light which had directivity as the object for right eyes and an object for left eyes, respectively is irradiated at an observer 2. And if the image for the object for right eyes and left eyes is displayed on time sharing by the space modulation element 4 synchronizing with this, performing the object for the right eyes of the light source 3, and luminescence for left eyes to time sharing, an observer 2 can see a display image as stereoscopic vision.
[0004] By the way, a screen size is determined by the display unit of the above-mentioned configuration in the magnitude of the large-sized convex lens 1 and the space modulation element 4. The space modulation element 4 is difficult to enlarge, and it is very expensive. This is remarkable especially when a liquid crystal panel is used as a space modulation element 4, and it is difficult to realize a big screen by the low price.
[0005] Then, these people applied for the display unit which can realize a big screen using a small liquid crystal panel as Japanese Patent Application No. No. 341840 [seven to]. Drawing 15 is drawing showing typically the important section configuration of the display unit shown by Japanese Patent Application No. No. 341840 [seven to]. In addition, this drawing shows only a condition until either of the two images, the object for right eyes corresponding to one observer and the object for left eyes, carries out image formation.
[0006] This display unit has the surface light source 5, convex lenses 6 and 7, a liquid crystal panel 8, and a convex lens 9. After light emitted from the surface light source 5 is made into parallel light with a convex lens 6, incidence of it is carried out to a liquid crystal panel 8. And the light figure corresponding to the light which penetrated the liquid crystal panel 8, i.e., the image displayed on the liquid crystal panel 8, is projected by the convex lens 9 with a convex lens 7, and a big screen is realized.
[0007] By the way, the luminescence field of the surface light source 5 is being suitably controlled according to an observer's location. For this reason, when an observer exists in the location [optical axis / of a convex lens 9] perpendicularly shifted, a condition until an image carries out image formation to that observer becomes a thing as shown in drawing 15 with a broken line, and the incidence locations of the light in a convex lens 9 differ.
[0008] The display position of the image on a display side will change with an observer's

locations from this. Moreover, since the display position of the image on a display changes with an observer's locations in this way, in order to display an image correctly, without being always missing, it must consider as a thing bigger enough than the size of the image which should display a convex lens 9.
[0009] On the other hand, the display unit of Japanese Patent Application No. No. 341840 [seven to] is emitting all the beams of light that can make the same the image for right eyes, and the image for left eyes, and can be emitted, and can also perform the usual plane view display.
[0010] However, as for the image for right eyes, and the image for left eyes, a display position will shift from a situation with them. [same with having mentioned above since the right eye and the left eye are perpendicularly estranged to the optical axis of a convex lens 9] For this reason, when the image for right eyes and the image for left eyes are made the same, after these images have shifted, it will be lapped and displayed, and will become the image with which it ****ed out of the focus. Since similarly it is projected on the image shifted corresponding to all the observer locations of a certain range by the convex lens 9, it becomes the image which faded as a result.
[0011] By the way, about the direction in alignment with the optical axis of a convex lens 9, although the above two faults originated in the gap of the image formation location to a perpendicular direction to the optical axis of a convex lens 9, since an observer's optimal location is prescribed to fixed distance by the set point of optical system, it cannot respond to migration before and after an observer. That is, the image which an observer can check by looking will fade as an observer separates from the image formation location of a convex lens 9.
[0012]
[Problem(s) to be Solved by the Invention] In realizing stereoscopic vision in a projection (projection) format, in the conventional display unit, there were the following faults as mentioned above.
(1) Since a projection image location changes with observer locations on a projection screen (display side), there is a possibility of giving an observer sense of incongruity. Moreover, the big thing beyond the need must be used for the convex lens used as a projection screen, and the enlargement beyond the need for an equipment appearance and a manufacture increase in cost are caused so that lack of an image may not occur, even if a projection image location changes.
[0013] (2) Since the object for right eyes differs in a projection image location from the object for left eyes, if it is going to perform the plane view display usual by emitting all the beams of light that can make a right-and-left image the same, and can be emitted, it will become the image with which it ****ed out of the focus.
[0014] (3) Since he is trying to project an image which is different to an eye on either side using the directivity of a lens, it will be fixed with the parameter of optical system and the observation location about the direction of an optical axis of optical system cannot respond to migration of an observer in the direction of an optical axis of optical system.
[0015] It is in the place which this invention is made in consideration of such a situation, and is made into the purpose offering the display unit which can set constant the transparency location of the light in the convex lens which serves as a projection screen irrespective of the image formation location about a direction perpendicular to the optical axis of optical system, and can set [1st] a projection image location always constant by this.
[0016] Moreover, it is in offering the display unit which this can be followed, and an observation location can be changed appropriately and can observe [2nd] a display image good from the location of arbitration even when an observer moves in the direction of an optical axis of optical system.
[0017]
[Means for Solving the Problem] In order to attain the above purpose [1st] the 1st invention In the display unit to which said watcher is made to do stereoscopic vision of the image by carrying out image formation of the image for right eyes and the image for left eyes which were generated in consideration of human being's binocular parallax by a watcher's right eye and left eye, respectively The light source which the location and magnitude of a field which emit light can be

changed to arbitration, for example, consists of a lamp and a monochrome liquid crystal panel, Space modulation elements, such as a liquid crystal panel which forms the light figure corresponding to a predetermined image using the light emitted from this light source, The 1st optical element, such as a convex lens with bigger opening than the image formation field of this space modulation element, It had the 2nd optical element, such as a convex lens arranged in the optical path from said space modulation element to said 1st optical element so that the predetermined field of this 1st optical element and the image formation field of said space modulation element may be considered as image formation relation.
[0018] Moreover, the 2nd invention was equipped with the 3rd optical element, such as prism which gives a bias include angle to the light which carries out incidence to said 2nd optical element by making the light by which outgoing radiation was carried out from the space modulation element refracted, while it had arranged the 1st optical element in said 1st invention so that the optical axis may shift to the optical axis of the 2nd optical element.
[0019] Moreover, the 3rd invention used the synthetic lens which consists of two convex lenses as the 2nd optical element in said 1st invention. Moreover, the 4th invention covered the space modulation element in said 1st invention by the predetermined medium which has a bigger refractive index than the refractive index of air.
[0020] In order to attain said 2nd purpose the 5th invention In the display unit to which said watcher is made to do stereoscopic vision of the image by carrying out image formation of the image for right eyes and the image for left eyes which were generated in consideration of human being's binocular parallax by a watcher's right eye and left eye, respectively The light source which the location and magnitude of a field which emit light can be changed to arbitration, for example, consists of a lamp and a monochrome liquid crystal panel, Space modulation elements, such as a liquid crystal panel which forms the light figure corresponding to a predetermined image using the light emitted from this light source, The 1st optical element, such as a convex lens with bigger opening than the image formation field of this space modulation element, The 5th optical element, such as a convex lens which carries out expansion projection of the light figure formed of said space modulation element to said 1st optical element, The image formation location adjustable means for changing the image formation location by said 1st optical element of the light figure in which expansion projection was carried out by this 5th optical element, An image pick-up means of plurality for example, such as a camera, to be arranged to said 1st optical system at a position, and to picturize an observer, respectively, Based on the image pick-up result out of which two or more of these image pick-up means come, respectively, the location of an observer's eye to said 1st optical system is detected. Said image formation location adjustable means is controlled, for example, it had the control means which consists of operation part and the electrical-potential-difference impression section so that the image formation location of the light figure by said 1st optical element might be doubled with the location.
[0021] Moreover, the 6th invention forms the light-scattering plate over which the light emitted from said 1st [the] thru/or the light source in the 5th one of invention is scattered in the location which serves as image formation relation to a predetermined observation location, and the space modulation element formed the light figure corresponding to a predetermined image using the light scattered about with said light-scattering plate.
[0022] Moreover, the 7th invention prepares the dispersion lens over which the light emitted from said 1st [the] thru/or the light source in the 5th one of invention is scattered so that a focus may be located in the location which serves as image formation relation to a predetermined observation location, and the space modulation element formed the light figure corresponding to a predetermined image using the light scattered about with said dispersion lens.

[0023] Moreover, while having the dispersion lens over which the light which the 8th invention was prepared so that a focus might be located in the location which serves as image formation relation to a predetermined observation location in addition to said 5th invention, and was emitted from the light source is scattered It has the refractive-index adjustable ingredient arranged so that the focal location of a dispersion lens may be changed by changing a refractive

index as an image formation location adjustable means. And a control means The refractive index of said refractive-index adjustable ingredient was controlled to consider the focal location of said dispersion lens, and the location of an observer's eyes as image formation relation.
[0024] Moreover, the 9th invention prepared the refractive-index adjustable ingredient in said 8th invention corresponding to each of the micro-lens cel of a large number in which it was prepared by the micro-lens array, and a control means changes the refractive index of each refractive-index adjustable ingredient according to an individual according to the location of two or more observers' eyes, and controlled each focal location of the micro-lens cel of said large number according to the individual.
[0025] According to the 1st thru/or the 4th invention, a big screen display is realized by expansion projection being carried out by the 1st optical element in which the light figure formed of the space modulation element has bigger opening than this space modulation element, but Since the 2nd optical means considers as image formation relation mutually, as for the image formation field of a space modulation element, and the predetermined field (image display field) of the 1st optical element, the light passing through the image formation field of a space modulation element, i.e., the light which forms a light figure, will surely pass along the predetermined field of the 1st optical element. Therefore, after the light by which image formation is carried out to the observer who is present in the location [optical axis / of optical system] shifted has inclined, even if it passes along a space modulation element, the light will surely penetrate a predetermined field in the 1st optical element, and the image display location in the 1st optical element is fixed to a predetermined field irrespective of a watcher's location.
[0026] Moreover, according to the 5th, 8th, and 9th invention, the location of an observer's eye to the 1st optical element is detected, and it is automatically controlled so that the image formation location by the 1st optical element is in agreement with the location of an observer's eyes.
[0027] Moreover, according to the 6th thru/or the 9th invention, further, the light irradiated by the space modulation element is scattered about with the dispersion lens or the light-scattering plate, and the brightness nonuniformity on a display side is reduced.
[0028] In addition, this invention is inherent in the following various invention.
(1) It is the display unit according to claim 1 to 7 which has the 6th optical element arranged in the optical path from a space modulation element to the 2nd optical element, and is characterized by the 2nd optical element considering said space modulation element and 1st optical element as image formation relation by collaboration with said 6th optical element.
[0029] (2) Claim 1 thru/or claim 7, and the above (1) which are characterized by having the 7th optical element which carries out incidence to a space modulation element after changing into a parallel ray the light emitted from the light source, a dispersion lens, or a light-scattering plate Display unit given in either.
[0030] (3) The above characterized by having the 8th optical element which condenses the light emitted from the light source, a dispersion lens, or a light-scattering plate to the 7th optical element (2) Display unit of a publication.
[0031] (4) The above characterized by using a micro lens (a compound eye lens, fly eye lens) as a dispersion lens (2) Or (3) Display unit of a publication.
(5) The above characterized by using a lenticular lens as a dispersion lens (2) Or (3) Display unit of a publication.
[0032] (6) The above characterized by grinding as a light-scattering plate and using glass (2) Or (3) Display unit of a publication.
(7) A space modulation element is claim 1 thru/or claim 7, and the above (1) which are characterized by forming the light figure corresponding to the image for right eyes, and the light figure corresponding to the image for left eyes in time sharing. Or (6) Display unit given in either.
[0033] (8) A space modulation element is claim 1 thru/or claim 7, and the above (1) which are characterized by coming to have the 1st component for forming the light figure corresponding to the image for right eyes, and the 2nd component for forming the light figure corresponding to the image for left eyes. Or (6) Display unit given in either.
[0034] (9) A space modulation element is claim 1 thru/or claim 7, and the above (1) which are

characterized by the ability to form the thing same as the light figure corresponding to the image for right eyes, and a light figure corresponding to the image for left eyes by time sharing. Or (8) Display unit given in either.
[0035] (10) A space modulation element is claim 1 thru/or claim 7, and the above (1) which are characterized by the ability to form the thing corresponding to the image which comes to superimpose the same image on the image same as the light figure corresponding to the image for right eyes, and a light figure corresponding to the image for left eyes, or the separate image for 2 eye type stereoscopic vision if needed. Or (9) Display unit given in either.
[0036] (11) Claim 5 thru/or claim 7, and the above (1) which are characterized by making the luminescence field of the light source into the whole surface compulsorily at the time of starting Or display unit given in either of (10).
[0037] (12) Claim 5 thru/or claim 7, and the above (1) which are characterized by having the supplemental lighting for illuminating an observer Or display unit given in either of (10).
(13) Claim 5 thru/or claim 7, and the above (1) which are characterized by making the luminescence field of the light source into the whole surface while making the thing same as the light figure corresponding to the image for right eyes, and a light figure corresponding to the image for left eyes form in a space modulation element, when the location of an observer's eyes is undetectable Or display unit given in either of (12).
[0038]
[Embodiment of the Invention]
(Gestalt of the 1st operation) With reference to a drawing, it explains per 1 operation gestalt of this invention hereafter. Drawing 1 is drawing showing typically the important section configuration of the display unit concerning this example. In addition, the same sign is given to the same part as drawing 15 .
[0039] As shown in drawing 1 , the display unit of this operation gestalt has a convex lens 6, a convex lens 7, a liquid crystal panel 8, a convex lens 9, a lamp 10, monochrome liquid crystal panel 11, the micro-lens array 12, a convex lens 13, and a convex lens 14, and becomes.
[0040] In the condition of having made the optical axis mutually in agreement, a convex lens 6 and a convex lens 7 counter mutually, and are arranged. And between this convex lens 6 and convex lens 7, the liquid crystal panel 8 as a space modulation element is installed in the condition of countering each of these convex lenses 6 and 7, and approaching a convex lens 7.
[0041] The convex lens 9 has the size equivalent to the screen size which it is going to obtain, and it is arranged in the opposite side that the liquid crystal panel 8 is arranged to a convex lens 7 so that it may become the image formation relation according [the location] to a liquid crystal panel 8, a convex lens 7, and a convex lens 14.
[0042] The lamp 10 has source of lamp light 10a, and concave mirror 10b. The light of source of lamp light 10a is condensed by concave mirror 10b, and outgoing radiation is carried out in the direction of an optical axis of convex lenses 6, 7, and 9 and the micro-lens array 12 in the form near a parallel ray.
[0043] It is arranged and monochrome liquid crystal panel 11 gets down so that the light a lamp 10 carries out [light] outgoing radiation may carry out incidence, and it controls to arbitration the transparency field of the light in which this lamp 10 carries out outgoing radiation per picture element. The micro-lens array 12 has much micro-lens cel 12a, and monochrome liquid crystal panel 11 is countered and it is arranged so that the light which penetrated each picture element of monochrome liquid crystal panel 11 to each of each micro-lens cel 12a may carry out incidence. In addition, the location which serves as image formation relation with convex lenses 13, 6, 7, 14, and 9 [focus or near / its / each micro-lens cel 12a of this micro-lens array 12] turns into an observation location. [each]
[0044] The convex lens 13 is arranged so that the light which carried out outgoing radiation from each micro-lens cel 12a between the micro-lens array 13 and the convex lens 6 may be condensed to a convex lens 6.
[0045] A convex lens 14 is installed in the location which considers a liquid crystal panel 8 and a convex lens 9 as image formation relation by collaboration with a convex lens 7. In addition, a convex lens 7 can be regarded as the convex lens 7 being close to the liquid crystal panel 8,

since a liquid crystal panel 8 is approached and it arranges, and the effectiveness of a convex lens 7 can also be disregarded.
[0046] Next, actuation of the display unit constituted as mentioned above is explained. In addition, since the principle for realizing stereoscopic vision is the same as that of the display unit shown by JP,6-225344,A and Japanese Patent Application No. No. 341840 [seven to], the detailed explanation is omitted and gives explanation of operation only about one side for the object for right eyes, or left eyes.
[0047] The various following display modes are possible by controlling suitably actuation of a liquid crystal panel 8 and monochrome liquid crystal panel 11 by the display unit of this example first.
(1) Stereoscopic vision display mode : while indicating the well-known image for 2 eye type stereoscopic vision for right and left by time sharing, switch the transparent mode for right and left for monochrome liquid crystal panel 11 to a liquid crystal panel 8 at time sharing synchronizing with time-sharing actuation of a liquid crystal panel 8.
(2) Plane view display mode : while displaying the image same as an image for right and left on a liquid crystal panel 8, switch monochrome liquid crystal panel 11 to the transparent mode for right and left at time sharing.
(3) Mixture mode of stereoscopic vision and plane view : while superimposing the image same as an image for right and left, and the drawing for 2 eye type stereoscopic vision and displaying on a liquid crystal panel 8, switch monochrome liquid crystal panel 11 to the transparent mode for right and left at time sharing.
(4) Whole surface plane view mode : while displaying the image same as an image for right and left on a liquid crystal panel 8, let monochrome liquid crystal panel 11 be the whole surface transparent mode.
[0048] In addition, the change of these display modes can be performed in response to the information on whether the video signal supplied from the source of a signal is 2 eye type stereoscopic vision video signal, or it is a plane view image. Or it adds, and it is as a result of [the] a judgment, and the judgment function of whether two video signals given are 2 eye type stereoscopic vision video signals or to be a plane view image can also be performed. Moreover, an observer results outside the stereoscopic vision observation range, and also when a control system breaks down, a display-mode change can be used.
[0049] Now, as for the light which carried out outgoing radiation from the lamp 10, only the field corresponding to an observation location is penetrated with monochrome liquid crystal panel 11. Incidence of the light which penetrated this monochrome liquid crystal panel 11 is carried out to micro-lens cel 12a corresponding to that transmitted picture element.
[0050] Micro-lens cel 12a is changing parallel light (plane wave) into the scattered light (spherical wave), as shown in drawing 2 , and it irradiates a uniform light at a liquid crystal panel 8. A convex lens 13 expands a convergent point (light source) by the virtual image, and changes the light source location on appearance. That is, micro-lens cel 12a scatters the light which penetrated monochrome liquid crystal panel 11 so that it may reduce the brightness nonuniformity on a display side (convex lens 9).
[0051] It is condensed with a convex lens 13 and incidence of the light by which outgoing radiation was carried out from micro-lens cel 12a is carried out to a convex lens 6. And after light which carried out incidence to the convex lens 6 is made into parallel light with this convex lens 6, incidence of it is carried out to a liquid crystal panel 8. Thereby, from a liquid crystal panel 8, outgoing radiation of the light figure corresponding to the image displayed on the liquid crystal panel 8 is carried out, and it is projected on it with a convex lens 7 to a convex lens 9.
[0052] Since it is arranged at this time so that a liquid crystal panel 8 and a convex lens 9 may carry out image formation mutually with a convex lens 7 and a convex lens 14, if the transmitted picture element is the same, incidence of the light which penetrated the liquid crystal panel 8 will surely be carried out to the same location of a convex lens 9 irrespective of the inclination at the time of transparency. That is, the light figure corresponding to the image displayed on the liquid crystal panel 8 is surely projected in the fixed location of a convex lens 9.
[0053] And image formation of the image on which it was projected by the convex lens 9 is

carried out with a convex lens 9 to either an observer's right eye or a left eye in the observation location corresponding to the transparency field of the light in monochrome liquid crystal panel 11.

[0054] Therefore, according to this operation gestalt, when observing from an observation location which is different to a perpendicular direction to the optical axis of a convex lens 9, the image projection location on a convex lens 9, i.e., a projection screen, turns into a fixed location. Thereby, even if an observer moves in the perpendicular direction to the optical axis of a convex lens 9, the display position of an image does not change. Moreover, since the image projection location of the image for right eyes and the image for left eyes is mutually in agreement also when it is made to penetrate light throughout monochrome liquid crystal panel 11 and this performs a plane view display while making the same the image for right eyes and the image for left eyes which are displayed on a liquid crystal panel 8 and, it becomes a clear image without dotage.

[0055] (Gestalt of the 2nd operation) Now, with the 1st operation gestalt mentioned above, expansion projection of the liquid crystal panel 8 is carried out with the convex lens 14 at the convex lens 9. The magnifying power k at this time sets distance of a liquid crystal panel 8 and a convex lens 14 to A, as shown in drawing 3 , and the distance of a convex lens 14 and a convex lens 9 is expressed with B, then k=B/A.

[0056] It is beta=tan, when the include angle (observer angle of visibility) of an observation location and the core of the convex lens 9 which is a display side is set to alpha on the other hand and the include angle (liquid crystal panel angle of visibility) of the light from the core of a liquid crystal panel 8 to a convex lens 14 is set to beta. -1 (k-tan alpha) -- (1)
It becomes.

[0057] It follows, for example, it will become beta=k-alpha if it is alpha<<1. If a scale factor k is set up greatly, in order for this to fully obtain an observer angle of visibility, a liquid crystal panel angle of visibility shows that a very big include angle is needed. In fact, although the angle of visibility of a liquid crystal panel 8 has the limited capacity, an observer angle of visibility will be further restricted by about 1/k to the possible angle of visibility which a liquid crystal panel 8 has.

[0058] Thus, with the above-mentioned 1st operation gestalt, by having formed the convex lens 14, the inclination of the light at the time of penetrating a liquid crystal panel 8 depending on an observation location will become large, and an observer angle of visibility will become narrow.

[0059] Then, below, it explains per 2nd operation gestalt of this invention which can ease the inclination of the light at the time of penetrating a liquid crystal panel 8. Drawing 4 is drawing showing typically the important section configuration of the display unit concerning this operation gestalt. In addition, the same sign is given to the same part as drawing 1 , and the detailed explanation is omitted.

[0060] As shown in drawing 4 , the display unit of this operation gestalt has a convex lens 6, a convex lens 7, a liquid crystal panel 8, a convex lens 9, a lamp 10, monochrome liquid crystal panel 11, the micro-lens array 12, a convex lens 13, a convex lens 14, and prism 41, and becomes.

[0061] That is, in addition to the display unit of the 1st operation gestalt mentioned above, the display unit of this operation gestalt forms prism 41 in the location as for which the light which carried out outgoing radiation from the convex lens 7 carries out incidence, and has become what shifted the optical axis of a convex lens 9 from the optical axis of other optical system.

[0062] A liquid crystal panel 8 and a convex lens 9 have an image formation relation mutually like the display unit of the 1st operation gestalt which also mentioned above the display unit of this operation gestalt. After an include angle is changed by prism 41, incidence of the light by which outgoing radiation was carried out from the liquid crystal panel 8 is carried out to a convex lens 14. Therefore, when an observer angle of visibility is 0, a bias include angle is set up between a convex lens 14 and prism 41.

[0063] When said formula (1) to an observer angle of visibility is large, the variation of a liquid crystal panel angle of visibility to the variation of an observer angle of visibility becomes small. The angle of visibility for which a liquid crystal panel 8 is needed can be beforehand stopped low

by setting up a bias include angle as mentioned above between a convex lens 14 and prism 41 so that it can guess from now on.
[0064] (Gestalt of the 3rd operation) Next, it explains per 3rd operation gestalt of this invention which can ease the inclination of the light at the time of penetrating a liquid crystal panel 8.
[0065] Drawing 5 is drawing showing typically the important section configuration of the display unit concerning this operation gestalt. In addition, the same sign is given to the same part as drawing 1 , and the detailed explanation is omitted. As shown in drawing 5 , the display unit of this operation gestalt has a convex lens 6, a liquid crystal panel 8, a convex lens 9, a lamp 10, monochrome liquid crystal panel 11, the micro-lens array 12, a convex lens 13, a concave lens 51, and the convex lens group 52.
[0066] That is, the display unit of this operation gestalt is what replaced with the convex lens 14 and formed the convex lens group 52 while it is replaced with the convex lens 7 in the display unit of the 1st operation gestalt mentioned above and forms a concave lens 51.
[0067] A concave lens 51 is for adjusting the inclination of the light at the time of penetrating a liquid crystal panel 8. The convex lens group 52 consists of two convex lenses 52a and 52b. The combination of these two convex lenses 52a and 52b can be dealt with as a lens compounded so that it might be well-known. At the example of drawing 5 , it is the principal point SH 2-1 by the side of an observer. It becomes the location of a liquid crystal panel 8, and is the principal point SH 2-2 by the side of a liquid crystal panel 8. It has relation it is unrelated to the mid-position of convex lens 52a and convex lens 52b.
[0068] And convex lenses 52a and 52b are arranged, respectively so that it may collaborate with a concave lens 51 and a liquid crystal panel 8 and the convex lens 9 of each other may be considered as image formation relation. Moreover, the location which serves as image formation relation to each of each micro-lens cel 12a of the micro-lens array 12 with convex lenses 13 and 6, a concave lens 51, and convex lenses 52b, 52a, and 9 turns into an observation location.
[0069] It sets to the display unit of the above configuration, and they are a liquid crystal panel 8 and the principal point SH 2-2. They are A' and the principal point SH 2-1 about distance. The scale factor of B' then a liquid crystal panel 8, and a convex lens 9 is expressed with k=A'/B' in distance with a convex lens 9.
[0070] At drawing 3 , the observer angle of visibility alpha and the liquid crystal panel angle of visibility beta are uniquely determined for the projection scale factor k. However, if a parameter is suitably chosen using the synthetic lens of convex lenses 52a and 52b, the relation between observer angle-of-visibility alpha' and liquid crystal panel angle-of-visibility beta' can be set up with a certain amount of degree of freedom so that drawing 5 may also show. That is, even if it enlarges a scale factor k, it can avoid becoming so large about liquid crystal panel angle-of-visibility beta' to watcher angle-of-visibility alpha'.
[0071] (Gestalt of the 4th operation) Next, it explains per 4th operation gestalt of this invention which can ease the inclination of the light at the time of penetrating a liquid crystal panel 8.
[0072] Drawing 6 is drawing showing typically the important section configuration of the display unit concerning this operation gestalt. In addition, the same sign is given to the same part as drawing 1 , and the detailed explanation is omitted. As shown in drawing 6 , the display unit of this operation gestalt has a convex lens 6, a convex lens 7, a liquid crystal panel 8, a convex lens 9, a lamp 10, monochrome liquid crystal panel 11, the micro-lens array 12, a convex lens 13, a convex lens 14, a case 61, and the enclosure medium 62.
[0073] The case 61 is arranged so that the perimeter of a liquid crystal panel 8 may be surrounded with a convex lens 7. The enclosure medium 62 has a bigger refractive index than the refractive index of air, and has enclosed the inside of the space formed in the convex lens 7 and the case 61.
[0074] That is, the display unit of this operation gestalt makes the configuration which covered the perimeter of the liquid crystal panel 8 in the display unit of the 1st operation gestalt mentioned above by the enclosure medium 62 with a bigger refractive index than the refractive index of air.
[0075] For the light of the include angle x which carries out incidence to a case 61 from a convex lens 7, by considering as such a configuration, an include angle is $y=\sin^{-1}\{(1/n)\sin x\}$

within the enclosure medium 62.
It is alike and is eased. Therefore, the angle of visibility for which a liquid crystal panel 8 is needed becomes small.
[0076] Although the display unit of the type which performs control of a luminescence field and the display of an image to time sharing at the object for right eyes and the object for left eyes with single monochrome liquid crystal panel 11 and the single liquid crystal panel 8 is illustrated as (the gestalt of the 5th operation) with each old operation gestalt by time Also in the display unit of the type which performs control of a luminescence field, and the display of an image by system which is respectively different by the object for right eyes, and the object for left eyes, the same means as each above-mentioned operation gestalt can be provided.
[0077] It explains per 5th operation gestalt of this invention which provided the same means as the 3rd operation gestalt mentioned above in the display unit of the type which performs control of a luminescence field, and the display of an image hereafter by system which is respectively different by the object for right eyes, and the object for left eyes.
[0078] Drawing 7 is drawing showing typically the important section configuration of the display unit concerning this operation gestalt. In addition, the same sign is given to the same part as drawing 1 and drawing 5 , and the detailed explanation is omitted.
[0079] As shown in drawing 7 , the display unit of this operation gestalt has convex lens 6-R, 6-L, liquid crystal panel 8-R, 8-L, a convex lens 9, lamp 10-R, 10-L, monochrome liquid crystal panel 11-R, 11-L, micro-lens array 12-R, 12-L, convex lens 13-R, 13-L, concave lens 51-R, 51-L, the convex lens group 52, and a half mirror 71.
[0080] Convex lens 6-R, liquid crystal panel 8-R, a convex lens 9, lamp 10-R, Monochrome liquid crystal panel 11-R, micro-lens array 12-R, convex lens 13-R, concave lens 51-R, and the convex lens group 52 Although it is in the same physical relationship as the convex lens 6 in the display unit of the 3rd operation gestalt mentioned above, a liquid crystal panel 8, a convex lens 9, a lamp 10, monochrome liquid crystal panel 11, the micro-lens array 12, a convex lens 13, a concave lens 51, and the convex lens group 52 In the optical path from the concave lens 51 to the convex lens group 52, the half mirror 71 is arranged in the condition of penetrating the light which goes to the convex lens group 52 from a concave lens 51 as it is.
[0081] On the other hand, convex lens 6-L, liquid crystal panel 8-L, lamp 10-L, monochrome liquid crystal panel 11-L, micro-lens array 12-L, convex lens 13-L, and concave lens 51-L Although a function and mutual physical relationship are the same as that of the convex lens 6 in the display unit of the 3rd operation gestalt mentioned above, a liquid crystal panel 8, a lamp 10, monochrome liquid crystal panel 11, the micro-lens array 12, a convex lens 13, and a concave lens 51 Those opticals axis Convex lens 6-R, liquid crystal panel 8-R, a convex lens 9, lamp 10-R, Monochrome liquid crystal panel 11-R, micro-lens array 12-R, convex lens 13-R, It is made to have differed from the optical axis which concave lens 51-R and the convex lens group 52 make 90 degrees, and it is arranged so that it may be reflected by the half mirror 71 and incidence of the light by which outgoing radiation is carried out from a concave lens 51 may be carried out to the convex lens group 52.
[0082] And it is liquid crystal panel 8-R by collaboration with the convex lens group 52 and concave lens 51-R. While the convex lens 9 has image formation relation, it is liquid crystal panel 8-L by collaboration with the convex lens group 52 and concave lens 51-L. The convex lens 9 has image formation relation. As opposed to each of each micro-lens cel 12a of micro-lens array 12-R Moreover, convex lens 13-R and 6-R, The location which serves as image formation relation with concave lens 51-R, the convex lens group 52, and a convex lens 9 turns into an observation location for right eyes. The location which serves as image formation relation to each of each micro-lens cel 12a of micro-lens array 12-L with convex lens 13-L, 6-L, concave lens 51-L, the convex lens group 52, and a convex lens 9 turns into an observation location for left eyes. The above configurations can also attain the same effectiveness as the display unit of the 3rd operation gestalt mentioned above.
[0083] (Gestalt of the 6th operation) Now, although it was for coping with migration of the observer about a perpendicular direction to the optical axis of optical system with each old operation gestalt, management to migration of an observer in the direction of an optical axis of

optical system is attained by providing the following means in addition to each of these operation gestalten.
[0084] Then, below, it explains per [which can also cope with migration of an observer in the direction of an optical axis of optical system] 6th example of this invention on the basis of the display unit of the 1st operation gestalt mentioned above.
[0085] Drawing 8 is drawing showing typically the important section configuration of the display unit concerning this operation gestalt. In addition, the same sign is given to the same part as drawing 1 , and the detailed explanation is omitted. As shown in drawing 8 , the display unit of this operation gestalt has a convex lens 6, a convex lens 7, a liquid crystal panel 8, a convex lens 9, a lamp 10, monochrome liquid crystal panel 11, a convex lens 13, a convex lens 14, the adjustable refractive-index optical element 81, a camera 82 (82-1 to 82-4), operation part 83, and the electrical-potential-difference impression section 84.
[0086] That is, the display unit of this operation gestalt is what formed a camera 82 (82-1 to 82-4), operation part 83, and the electrical-potential-difference impression section 84 while it is replaced with the micro-lens array 12 in the display unit of the 1st operation gestalt mentioned above and forms the refractive-index good light variation study component 81.
[0087] The refractive-index good light variation study component 81 has composition which sandwiched many refractive-index adjustable ingredients 813 with the micro-lens array 811 and the glass plate 812, and formed the transparent electrode 814 between the micro-lens array 811 and the refractive-index adjustable ingredient 813, and formed the transparent electrode 815 between the glass plate 812 and the refractive-index adjustable ingredient 813, respectively.
[0088] Like the micro-lens array 12, the micro-lens array 811 has much micro-lens cel 811a, it counters monochrome liquid crystal panel 11 so that the light which penetrated each picture element of monochrome liquid crystal panel 11 to each of each micro-lens cel 811a may carry out incidence, and the refractive-index good light variation study component 81 is arranged.
[0089] The refractive-index adjustable ingredient 813 is the thing of the common knowledge from which a refractive index n (dielectric constant) changes according to the reinforcement of the electric field generated between a transparent electrode 814 and a transparent electrode 815, and is prepared corresponding to each of micro-lens cel 811a. In addition, a refractive index n is changed with the refractive index of micro-lens cel 811a.
[0090] Between the transparent electrode 814 and the transparent electrode 815, the electrical-potential-difference impression section 84 is connected, and applied voltage is controlled by this electrical-potential-difference impression section 84 every refractive-index adjustable ingredient 813. The camera 82 is arranged in four corners of a convex lens 9, respectively, as shown in drawing 10 , and it is arranged so that an observer may be picturized. A camera 82 gives the video signal which picturized and generated the predetermined image pick-up range to operation part 83, respectively. In addition, at this operation gestalt, a camera 82 is 30 frame/like the camera usually used. A second (fps) is assumed. However, since such camera information should just have the time amount resolution which can follow in footsteps of migration [an observer] as a display of this invention, it may be 30 or less fpses.
[0091] Operation part 83 judges an observation location based on the video signal given from a camera 82, and it controls the electrical-potential-difference impression section 84 so that it may carry out image formation of the image to the observation location. The electrical-potential-difference impression section 84 changes the electrical potential difference impressed between a transparent electrode 814 and each transparent electrode 815 according to control by operation part 83, and changes the reinforcement of the electric field produced between a transparent electrode 814 and each transparent electrode 815.
[0092] Next, actuation of the display unit constituted as mentioned above is explained. The actuation also with the fundamental display unit of this operation gestalt is the same as that of the display of the 1st operation gestalt mentioned above. However, as it is the following, the observation location is controlled by the display unit of this operation gestalt.
[0093] First, a refractive index n (dielectric constant) changes according to the reinforcement of the electric field which produce the refractive-index adjustable ingredient 813 of the refractive-index good light variation study component 81 between the transparent electrodes 811 and

transparent electrodes 812 which were prepared in both ends. And the reinforcement of the electric field produced between a transparent electrode 811 and a transparent electrode 812 changes according to the magnitude of the electrical potential difference impressed between a transparent electrode 811 and a transparent electrode 812.
[0094] For this reason, by changing the electrical potential difference impressed between a transparent electrode 811 and a transparent electrode 812, the focus of the light which carried out outgoing radiation from micro-lens cel 811a will change, as shown to drawing 11 in f1 and f2. The micro-lens array 811 supports the micro-lens array 12 in the display unit of the 1st operation gestalt which ******(ed), and image formation of the focus of micro-lens cel 811a is carried out to an observation location also in this operation gestalt by the optical system after this. Therefore, when the focus of the light which carried out outgoing radiation changes from micro-lens cel 811a as mentioned above, an observation location will change.
[0095] Here, generally the refractive-index adjustable ingredient 813 is difficult for changing a refractive index sharply, and the amount to which the focus of the light which carried out outgoing radiation can be changed from micro-lens cel 811a is restricted. However, with this operation gestalt, since expansion projection of the light which carried out outgoing radiation from the refractive-index good light variation study component 81 is carried out by subsequent optical system at a convex lens 9, as shown in drawing 12 , change of the focus of light which carried out outgoing radiation from micro-lens cel 811a will be expanded, will appear as change of an observation location, and can fully change an observation location.
[0096] In addition, drawing 12 shows that an observation location in case the focus of the light in which the observation location in case the focus of the light in which the observation location in case the focus of the light which carried out outgoing radiation is Pa carried out outgoing radiation from Pa1 and micro-lens cel 811a is Pb carried out outgoing radiation from Pb1 and micro-lens cel 811a is Pc is set to Pc1 from micro-lens cel 811a.
[0097] Now, in this example, operation part 83 controls an observation location as follows using an above-mentioned property. That is, operation part 83 incorporates first the video signal which each of a camera 82-1 to 82-4 outputs (the step ST 1 in drawing 13).
[0098] Next, operation part 83 performs feature extractions (step ST 3), such as an extract of the phase (topology)-description or the geometric-like description, based on the result of this pretreatment, after pretreating performing a profile extract etc. while performing noise reduction, level adjustment of the signal from each camera, etc. (step ST 2).
[0099] Then, operation part 83 performs position vector detection (step ST 5) for identifying the parts of an observer's face and the number, each observer's left eye, and a right eye (step ST 4), and detecting the location of a left eye and a right eye about each of the observer who identified as a three-dimension position vector (a position vector being called hereafter) on the basis of a convex lens 1.
[0100] And operation part 83 performs refractive-index control (step ST 6) which creates the control information for setting up the condition of the refractive-index adjustable ingredient 813 of the refractive-index good light variation study component 81 so that the location which the detected position vector shows may be made into an observation location, and gives this to the electrical-potential-difference impression section 84. If the above-mentioned control information is received, the electrical potential difference impressed between a transparent electrode 814 and each transparent electrode 815 will be controlled by the electrical-potential-difference impression section 84, respectively that it should consider as the condition that control information shows the refractive index of each refractive-index adjustable ingredient 813 of the refractive-index good light variation study component 81.
[0101] Operation part 83 repeats processing of a more than whenever the video signal for one frame is outputted from a camera 82-1 to 82-4. However, the feature extraction of a step ST 3 and discernment of a step ST 4 may carry out infanticide processing in the direction of time amount. For example, as the whole actuation, the unnaturalness like ** is not generated as processing speed of 3fps extent.
[0102] The algorithm shown in the above drawing 13 by the thick wire is feedforward control, and, essentially, is influenced of errors, such as optical system which constitutes a display unit,

an error of liquid crystal panel 8 grade, and product dispersion by the gap with a design and manufacture. However, this can lessen effect by incorporating so that an error may be beforehand amended at the time of manufacture.
[0103] However, an error, a manufacture error, etc. of optical system are improvable by performing feedback control by the algorithm shown in drawing 13 with a thin line. That is, operation part 84 performs right-and-left light separation (step ST 7) for separating the information on light which the exposure light from a display was equivalent to each observer's left eye and right eye, respectively, and reflected in them based on the video signal inputted at a step ST 1, and the position vector detected at a step ST 5. In addition, although the video signal inputted at a step ST 1 here is referred to, the result of pretreatment at a step ST 2 can also be referred to.
[0104] Now, right-and-left light separation can separate the information on light easily reflected by the left eye and the right eye synchronizing with time-sharing actuation of this display, if you are trying to display the image for right eyes, and the image for left eyes on time sharing like this operation gestalt. However, when the image for right eyes and the image for left eyes are compounded by coincidence like the 5th operation gestalt mentioned above, in time-sharing actuation, the information on light reflected by the left eye and the right eye cannot be separated. then, the polarizing plate which penetrates the polarization component of ** for left eyes, for example to a camera 82-1 and 82-2 while setting the polarization the object for the left eyes of the light projected on a convex lens 1, and for right eyes as orthogonality relation in this case -- moreover, a camera 82-3 and the polarizing plate which penetrates the polarization component for right eyes to 82-4 -- what is necessary is just to each equip At this time, it is thought that every polarization component of the reflected light from the observer by the natural lights other than the light which this display unit irradiates is equal. Therefore, if the difference of a camera 82-1, the output signal of 82-2, and a camera 82-3 and the output signal of 82-4 is taken, the signal of the natural light will be set to about 0, and the reflective component of display exposure light will remain. And the reflective component of the exposure light for left eyes and a negative-electrode signal can carry out the separation extract of the positive-electrode signal as a reflective component of the exposure light for right eyes, corresponding to the polarity of difference.
[0105] Then, operation part 84 detects the exposure situation to the left eye and right eye to each observer based on the result of the above-mentioned right-and-left light separation (step ST 8), and feeds back the result to the refractive-index control in a step ST 6. At this time, if the gap has produced operation part 84 in the refractive-index control in a step ST 6 in the exposure situation to the left eye and right eye to each observer, it will adjust so that that gap may be amended and it may become the optimal.
[0106] By the way, although image pick-up data will be obtained with a camera 82 and a system will start if an observer is in the basis of a certain lighting, in darkness, a problem is in starting. Then, startability is securable, if monochrome liquid crystal panel 11 is made into a complete transparency condition at the time of system starting and it is made to irradiate light from the display unit of this operation gestalt to an observer. Or startability is also securable by equipping with the lighting for assistance separately.
[0107] In addition, image display can be performed, if a mode of operation is compulsorily changed to the whole surface plane view display mode which makes monochrome liquid crystal panel 11 the whole surface transparent mode, and realizes plane view while displaying the image same as an image for right and left, when a watcher's location cannot be decided.
[0108] In addition, control of the observation location explained here is for coping with only migration of the observer about the direction of an optical axis of optical system. In order to cope with migration of the observer about a direction perpendicular to the optical axis of optical system, it is made by control of the luminescence field of the light source as shown by Japanese Patent Application No. No. 341840 [seven to], i.e., this operation gestalt, by control of the transparency field of the light in monochrome liquid crystal panel 11.
[0109] As mentioned above, according to this operation gestalt, even if it can acquire upwards the same effectiveness as the 1st operation gestalt mentioned above and an observer moves in

the direction of an optical axis of optical system, an observation location can always be controlled in the location of an observer's eyes, and management to migration of the observer about the direction of an optical axis of optical system is attained.
[0110] In addition, this invention is not limited to said each operation gestalt. For example, with said 3rd operation gestalt, although explanation of operation with a concave lens 51 is performed, even if it transposes a concave lens 51 to a convex lens, the same effectiveness is acquired.
[0111] Although said 5th operation gestalt showed the display unit of 2 eye type, it cannot be overemphasized that a multi-eye type (m eye type) can realize easily the component which carried out the subscript of L and R in drawing 7 if the same composition as m (integer) network ****** is performed. What is necessary is just to display the image to which a multi-eye type corresponds according to an observer's angle of visibility at this time.
[0112] Although it has illustrated coming a thing on the basis of the configuration of the display unit of the 1st operation gestalt and has the convex lens 14 with said 6th operation gestalt, this convex lens 14 may be omitted.
[0113] Although change of the observation location about the direction of an optical axis of optical system is enabled with said 6th operation gestalt by changing the focus of micro-lens cel 811a using the refractive-index adjustable ingredient 813 Change of the observation location about the direction of an optical axis of optical system can be enabled also by moving the location of either of various kinds of lenses prepared in each operation gestalt, for example according to a mechanical migration device, and moving the focus of the lens. In addition, it is necessary to also change the location of a convex lens 14 or the lens group 52, and to maintain a liquid crystal panel 8 and a convex lens 9 at image formation relation in this case. It will become impossible however, to correspond only to one observer in this case.
[0114] With said 6th operation gestalt, although four cameras 82 are used, there should just be at least two cameras 82. However, since the detection system of an observer's location improves so that the number of a camera 82 is increased, more ones are desirable.
[0115] Although said each operation gestalt explained the liquid crystal panel 8 and monochrome liquid crystal panel 11 using the transparency mold, it is obvious that it is realizable even if it uses a reflective mold. Moreover, if it is the component which can perform a space modulation, it will not be limited to a liquid crystal panel.
[0116] Various kinds of lenses of your realizing by being what combined two or more lenses used with said each operation gestalt are natural. Moreover, various kinds of lenses used with each above-mentioned operation gestalt may be replaced with a reflecting mirror with the same effectiveness. Moreover, a plastic lens is sufficient as various kinds of lenses used with each above-mentioned operation gestalt besides the usual glass lens, and a Fresnel lens and an aspheric lens are sufficient as them.
[0117] The lamp 10 in said each operation gestalt and monochrome liquid crystal panel 11 may replace with, and the high brightness Braun tube may be used. With said each operation gestalt, although the micro-lens array 12,811 is used as a dispersion lens, a lenticular lens etc. can also be used. Moreover, light-scattering plates, such as ground glass and an optical diffusion ingredient, can also be used instead of a dispersion lens.
[0118] With said each operation gestalt, although the micro-lens array 12,811 is considering as the convex lens type, it functions almost similarly as a concave lens type. Moreover, the sense of the side in which the micro-lens cel 12,811 was formed is functioned almost similarly as reverse.
[0119] Moreover, even if it does not not necessarily use convex lenses 6, 7, and 13, the fundamental effectiveness of this invention is acquired. In addition, deformation implementation various in the range which does not deviate from the summary of this invention is possible.
[0120]
[Effect of the Invention] In the display unit to which said watcher is made to do stereoscopic vision of the image when the 1st invention carries out image formation of the image for right eyes and the image for left eyes which were generated by a watcher's right eye and left eye in consideration of human being's binocular parallax, respectively The light source which the location and magnitude of a field which emit light can be changed to arbitration, for example,

consists of a lamp and a monochrome liquid crystal panel, Space modulation elements, such as a liquid crystal panel which forms the light figure corresponding to a predetermined image using the light emitted from this light source, The 1st optical element, such as a convex lens with bigger opening than the image formation field of this space modulation element, It had the 2nd optical element, such as a convex lens arranged in the optical path from said space modulation element to said 1st optical element so that the predetermined field of this 1st optical element and the image formation field of said space modulation element may be considered as image formation relation.

[0121] Moreover, the 2nd invention was equipped with the 3rd optical element, such as prism which gives a bias include angle to the light which carries out incidence to said 2nd optical element by making the light by which outgoing radiation was carried out from the space modulation element refracted, while it had arranged the 1st optical element in said 1st invention so that the optical axis may shift to the optical axis of the 2nd optical element.

[0122] Moreover, the 3rd invention used the synthetic lens which consists of two convex lenses as the 2nd optical element in said 1st invention. Moreover, the 4th invention covered the space modulation element in said 1st invention by the predetermined medium which has a bigger refractive index than the refractive index of air.

[0123] By these, the light passing through the image formation field of a space modulation element, i.e., the light which forms a light figure, will surely pass along the predetermined field of the 1st optical element. Therefore, after the light by which image formation is carried out to the observer who is present in the location [optical axis / of optical system] shifted has inclined, even if it passes along a space modulation element The light will surely penetrate a predetermined field in the 1st optical element. The image display location in the 1st optical element will be fixed to a predetermined field irrespective of a watcher's location. It becomes the display unit which can set constant the transparency location of the light in the convex lens which serves as a projection screen irrespective of the image formation location about a direction perpendicular to the optical axis of optical system, and can set a projection image location always constant by this.

[0124] In the display unit to which said watcher is made to do stereoscopic vision of the image when the 5th invention, on the other hand, carries out image formation of the image for right eyes and the image for left eyes which were generated by a watcher's right eye and left eye in consideration of human being's binocular parallax, respectively The light source which the location and magnitude of a field which emit light can be changed to arbitration, for example, consists of a lamp and a monochrome liquid crystal panel, Space modulation elements, such as a liquid crystal panel which forms the light figure corresponding to a predetermined image using the light emitted from this light source, The 1st optical element, such as a convex lens with bigger opening than the image formation field of this space modulation element, The 5th optical element, such as a convex lens which carries out expansion projection of the light figure formed of said space modulation element to said 1st optical element, The image formation location adjustable means for changing the image formation location by said 1st optical element of the light figure in which expansion projection was carried out by this 5th optical element, An image pick-up means of plurality for example, such as a camera, to be arranged to said 1st optical system at a position, and to picturize an observer, respectively, Based on the image pick-up result out of which two or more of these image pick-up means come, respectively, the location of an observer's eye to said 1st optical system is detected. Said image formation location adjustable means is controlled, for example, it had the control means which consists of operation part and the electrical-potential-difference impression section so that the image formation location of the light figure by said 1st optical element might be doubled with the location.

[0125] Moreover, the 6th invention forms the light-scattering plate over which the light emitted from said 1st [the] thru/or the light source in the 5th one of invention is scattered in the location which serves as image formation relation to a predetermined observation location, and the space modulation element formed the light figure corresponding to a predetermined image using the light scattered about with said light-scattering plate.

[0126] Moreover, the 7th invention prepares the dispersion lens over which the light emitted

from said 1st [the] thru/or the light source in the 5th one of invention is scattered so that a focus may be located in the location which serves as image formation relation to a predetermined observation location, and the space modulation element formed the light figure corresponding to a predetermined image using the light scattered about with said dispersion lens.

[0127] Moreover, while having the dispersion lens over which the light which the 8th invention was prepared so that a focus might be located in the location which serves as image formation relation to a predetermined observation location in addition to said 5th invention, and was emitted from the light source is scattered It has the refractive-index adjustable ingredient arranged so that the focal location of a dispersion lens may be changed by changing a refractive index as an image formation location adjustable means. And a control means The refractive index of said refractive-index adjustable ingredient was controlled to consider the focal location of said dispersion lens, and the location of an observer's eyes as image formation relation.
[0128] Moreover, the 9th invention prepared the refractive-index adjustable ingredient in said 8th invention corresponding to each of the micro-lens cel of a large number in which it was prepared by the micro-lens array, and a control means changes the refractive index of each refractive-index adjustable ingredient according to an individual according to the location of two or more observers' eyes, and controlled each focal location of the micro-lens cel of said large number according to the individual.
[0129] Even when the location of an observer's eye to the 1st optical element will be detected by these, it will be automatically controlled so that the image formation location by the 1st optical element is in agreement with the location of an observer's eyes, and an observer moves in the direction of an optical axis of optical system, this can be followed, an observation location can be changed appropriately and it becomes the display unit which can observe a display image good from the location of arbitration.

[Translation done.]